Overview

- DDS provides the dynamic data bus needed for UAV control stations
- Discovery allows for the configuration to change for each vehicle
- Publish/subscribe works to decouple services allowing for different message sequences for each vehicle
- Partitions enable multiple vehicles by separating the software for each vehicle.
- Domains allow for separating flight critical software
- DDS Secure protects the domain from malignant services

DDS meets the needs of the Control Station architecture
The control stations provide command and control of an unmanned air vehicle (UAV)

A common control station controls more than one type of UAV

A control station is made up of a set of services

Services defined by the Unmanned Systems (UxS) Control Segment (UCS) Architecture standard

Some services are common to all vehicles

Some services are unique to a single vehicle

The Control Station needs a dynamic, configurable messaging bus
Discovery

- The services for a vehicle consists of some of the common services and some of the unique.
- Discovery allows the correct set of services for a specific vehicle type to be started.
- DDS Discovery is dynamic so that any set of services can be started and they all discover each other.
- Vehicle service sets are configurable instead of hard coded.
Publish/Subscribe

- With Pub/Sub, when a service publishes data, it does not need to know who is subscribing to the data.
- The subscriber does not need to know who publishes it.
- This decouples the publisher and the subscriber.
- This allows different vehicles to have different communication paths without the services being modified.
Partitions

- The control station can control multiple vehicles at once
- Within a domain, a partition is used to separate the services and topics for each vehicle
- The same set of topics and services may be used for each vehicle
- Partitions segregate the services to prevent cross communication

**Diagram:**
- DDS Domain
  - Vehicle 1 Partition
    - Service A
    - Topic A
    - Service B
  - Vehicle 2 Partition
    - Service A
    - Topic A
    - Service B

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Flight Separation

- Safety requirements necessitate the separation of flight critical software from non-flight critical software
- Flight critical data is walled off in a separate domain
- Since discovery only works within an individual domain, Non Flight Critical services cannot see the Flight Critical Services
- The domains are connected using a bridge that is connected to both domains
- The bridge limits the data passed between the domains
 DDS Secure

- Separating flight critical data into a separate domain only solves part of the issue
- If the system is compromised, bad actors can still connect to the domain and disrupt the flight critical software
- DDS Secure ensure the only services in the flight critical domain are the correct services
  - Services must authenticate to join the domain and it’s partitions
  - Services must further be authorized connect to topics
- DDS Secure encrypts the data to ensure its not modified in transit

DDS Secure protects the flight critical domain
Conclusion

- Control Systems require:
  - The highest levels of performance, scalability, reliability and security
  - A modular open systems architecture to minimize integration and foster reuse
  - Rapid reconfiguration to meet evolving mission requirements

- For these reasons, DDS is the connectivity standard for mission-critical systems.
Questions?